May 3, 1966 J. J. KOWALEWSKI 3,249,909

STRAIN-RELIEVED ELECTRICAL CORD DEVICE

Filed Nov. 15, 1963

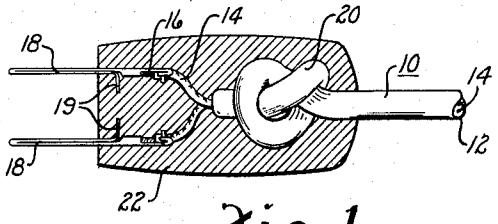

Fig. 1

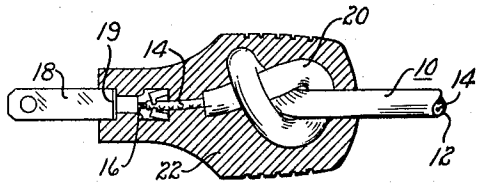

Fig. 2

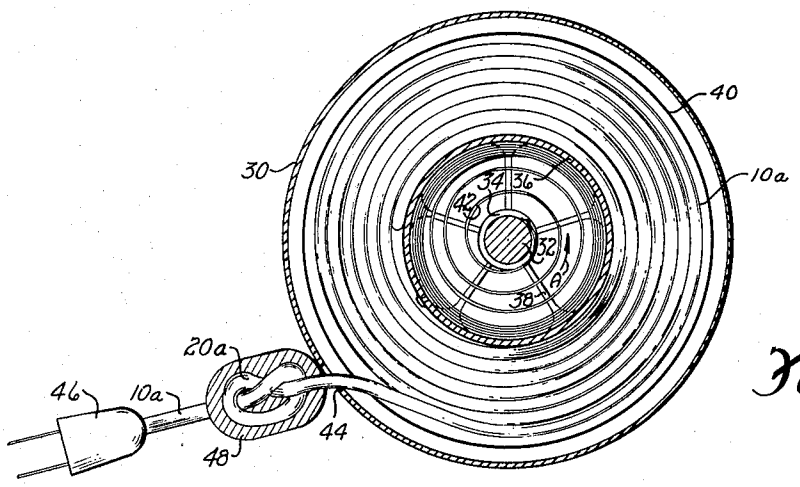

Fig. 5

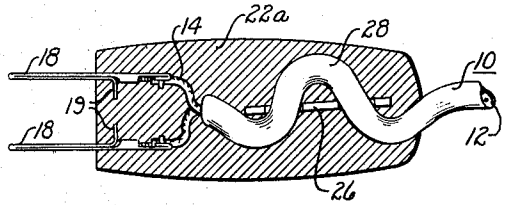

Fig. 3

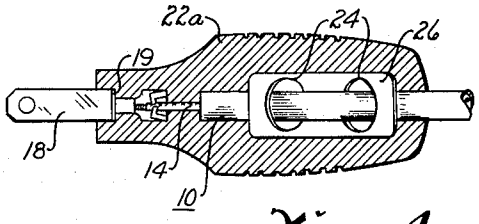

Fig. 4

INVENTOR.
John J. Kowalewski

BY
Thomas C. Betts
HIS ATTORNEY

United States Patent Office 3,249,909
Patented May 3, 1966

3,249,909

STRAIN-RELIEVED ELECTRICAL CORD DEVICE

John J. Kowalewski, Riverside, Conn., assignor to Electrolux Corporation, Old Greenwich, Conn., a corporation of Delaware

Filed Nov. 15, 1963, Ser. No. 323,956
6 Claims. (Cl. 339—105)

My invention relates to electric cord sets and more particularly to means for providing a strain relief to protect the electrical connections between the conductors in the cord and the contact members in the plug from mechanical strains produced when force is applied to the cord, rather than directly to the plug, for disconnecting the latter from a receptacle.

For many years, when the bodies of electric plugs were made of rigid insulating material to which the contacts were fixed, it was common practice to provide a strain relief by either snubbing the individual conductors around the contacts before electrically connecting them by means of binding screws, or by tying insulated portions of the individual conductors together to form a knot too large to pass through an opening in the plug body. In either case, although the connections between the conductors and contacts were relieved of strain, all of the strain was transmitted through the individual conductors, rather than through only the strong outer jacket used to enclose the conductors.

More recently, it has been the practice to connect the contacts to the conductors and then mold a plug body of vinyl, or other suitable plastic material, around the end of the cord and at least a portion of the contacts. With this arrangement the only strain relief is that provided by any bond which may be formed between the molded body and the insulation of the cord. If the latter is rubber, or a rubber compound, which is a superior insulation, it will not bond with vinyl, and hence this is no strain relief. Even if vinyl is used as insulation, due to the fact that the cord extends in a straight line through the plug parallel to the direction of application of the force, the bond is placed under shear, and is apt to be easily destroyed. It is desirable to use vinyl, rather than rubber, for the plug because the former requires much less curing time, is less expensive and may be readily obtained in a wide variety of colors.

In accordance with my invention a sharp bend is formed in a jacketed portion of the cord and the plug body is molded around this bent portion. Consequently, force applied to the cord will be transmitted through the relatively strong jacket thereof directly to the plug body mechanically, and without relying on a bond between them.

Any suitable means may be utilized for providing the sharp bend in the cord. One preferred means in accordance with my invention is to tie a simple knot in the jacketed portion of the cord closely adjacent to the end thereof to which it is desired to connect the plug, the latter then being molded around the knot. Another is to thread the cord through closely spaced apertures in a stiff plate member so as to provide a sharp bend in the former, the plug then being molded around the bent portion of the cord and the plate member.

Further objects and advantages of my invention will be apparent from the following description considered in connection with the accompanying drawings which form part of this specification and of which:

FIG. 1 is a cross-sectional view of a molded plug embodying a strain relief provided by tying a knot in the cord;

FIG. 2 is a cross-sectional view of the device shown in FIG. 1, but taken at 90° thereto;

FIG. 3 is a view similar to FIG. 1, but showing a strain relief provided by threading the cord through an apertured plate;

FIG. 4 is a cross-sectional view of the arrangement shown in FIG. 3, but taken at 90° thereto; and

FIG. 5 is a cross-sectional view of a cordwinder, the cord of which is provided with a snubber having a strain relief in accordance with the present invention located adjacent to the plug end of the cord in order to relieve the plug of strain when the cord is completely rewound.

Referring more particularly to FIGS. 1 and 2, reference character **10** designates generally an electric cord. This cord includes a relatively strong outer protective insulating jacket **12** which is preferably made of rubber or a rubber compound. Encased within the jacket **12** are conductors **14**, each conductor being individually insulated. As is shown, a short length of the jacket **12** has been removed from the left-hand end of the cord, as viewed in FIGS. 1 and 2, so that short lengths of the insulated conductors **14** extend therebeyond. The extreme end of each conductor is preferably stripped of insulation as is shown at **16** and is secured, as by crimping, to the inner end of a contact prong **18**. Each prong has a laterally extending anchoring lug **19**. A simple knot **20** is tied in the jacketed portion of the cord closely adjacent to the end of the jacket.

A plug body **22** is molded around the knot **20**, the extending ends of the individually insulated conductors **14** and the inner ends of the contact prongs **18**, including the anchoring lugs **19**. The plug **22** is preferably molded of vinyl which will not form a bond with the rubber material of jacket **12**. However, due to the presence of the knot **20**, if the user grasps the cord, rather than the plug, and exerts a pull lengthwise of the cord for the purpose of disconnecting the prongs **18** from a receptacle, this force will be transmitted directly through the cord jacket **12** to the knotted portion of the cord and directly to the plug body **22** and thence via the anchoring lugs **19** to the prongs **18** without producing stress in the conductors **14** and particularly their connections with the contact prongs **18**.

In the embodiment illustrated in FIGS. 3 and 4 the jacketed portion of the cord **10** adjacent one end thereof is threaded through closely spaced apertures **24** formed in a sheet or plate **26** of stiff material, which forces the cord to assume a sharp bend, as indicated at **28**, and the plug **22***a* is molded around this bent portion of the cord, and of course around the plate **26**. This arrangement functions in much the same manner as that described in connection with FIGS. 1 and 2. Thus, a tensile force applied to the enclosing jacket **12** of the cord **10** is transmitted through the bent portion thereof directly to the body **22***a* of the plug, and thence to the prongs **18**, and the individual conductors, and particularly the connections thereof to the prongs **18**, are entirely relieved of strain.

In each of these embodiments the bent portion of the cord is somewhat resilient and hence, if the pull on the cord is in the form of a sudden jerk, the bent portion absorbs some of the shock.

In FIG. 5 there is shown a cordwinder for reeling up a cord **10***a*. The cordwinder includes a casing **30** within which is disposed a fixed shaft **32**. Rotatably mounted on the shaft is a hub **34** of a reel having cylindrical drum **36** supported from the hub by means of spokes **38**. Drum **36** carries a pair of spaced flanges, one of which is shown at **40**. A spiral clock spring **42** is connected between the inner surface of drum **36** and the fixed shaft **32** and tends to rotate the drum in the direction of the arrow A.

One end of the cord **10***a* is secured to the drum **36**, while the other end extends outwardly through an open-

ing 44 formed in the casing 30. A plug 46 is secured to the end of the cord and this plug may be in accordance with either of the embodiments previously described, or might be an ordinary plug without strain relief. Close to the plug the cord has a knot 20*a* tied therein and a body 48 of plastic material, such as vinyl, is molded around the knot.

In use, the extending end of the cord is grasped and pulled outwardly, thus rotating the drum 36 in a direction counter to the arrow A which causes the spiral spring 42 to be wound. Suitable latch mechanism, not shown, is provided for preventing rotation of the drum by the spring 42 when the pull on the cord is released. The plug 46 may then be inserted in a suitable receptacle so as to furnish electric power to the appliance with which the cord reel is used.

When it is desired to disconnect the plug 46, it is removed from the receptacle in the usual manner and the latch mechanism which restrains the drum 36 from rotating is released, usually by an outward jerk on the cord, and the spring 42 rotates the drum 36 in the direction of the arrow A so as to rewind the cord on the drum between the flanges 40 thereof. Usually, the operator lets go of the cord as soon as it starts to rewind and permits it to run in by itself. Rotation of the drum is suddenly stopped when the snubber reaches the opening 44, through which it is too large to pass. With the arrangement shown the force is transmitted directly from the knotted portion 20*a* of the cord to the snubber 48 and thence to the casing 30. Thus, the plug 46 is completely relieved of all strain incident to stopping rotation of the reel.

While I have shown specific examples of my invention, it is to be understood that this has been done for purposes of illustration only and that the scope is not to be limited thereby, but is to be determined from the appended claims.

What I claim is:

1. In a strain-relieved electrical cord device, an insulated electrical cord comprising a plurality of individually insulated conductors encased within a relatively strong insulating and protective tubular jacket, said electrical cord including said jacket having a plurality of closely adjacent sharply bent portions within the length thereof, a body of material molded around and supporting said sharply bent jacketed cord portions in an enclosing and closely embracing manner whereby a tensile strain applied to the cord is directly transmitted by said jacket to said body through substantially the entire outer surface of said jacket within said sharply bent portions thereof to thereby maintain said insulated conductors within said jacket free of said strain.

2. The strain-relieved electrical cord device as defined in claim 1 wherein said sharply bent portions of said insulated jacketed cord comprise a knot tied therein.

3. The strain-relieved electrical cord device as defined in claim 1 wherein said sharply bent portions of said jacketed cord include a plate member having a plurality of closely spaced apertures therethrough,

and a portion of said insulated jacketed cord extending through said apertures.

4. In a strain-relieved electrical cord device, an insulated electrical cord comprising a pair of individually insulated conductors, a relatively strong insulating and protective tubular jacket enclosing said individually insulated conductors, said conductors having portions extending a short distance out of one end of said enclosing jacket, a pair of contacts electrically connected to the extending ends of said conductors, said cord including said insulating jacket having a plurality of closely adjacent slightly resilient sharply bent portions therein adjacent

to said one end of the jacket, and a body of material molded around and enclosing and closely embracing said sharply bent portion of said jacketed cord and said extending ends of the conductors and at least a portion of said contacts whereby a tensile force applied to said cord including said insulating jacket and said sharply bent portions therein adjacent to said one end of the jacket is transmitted directly to and through said body to said contacts by substantially the entire outer surface of said jacket within said slightly resilient sharply bent portions to thereby maintain said insulated conductors and the connections between said insulated conductors and contacts free of said force.

5. In an electrical cord device, an insulated electric cord comprising a pair of individually insulated conductors enclosed in a relatively strong insulating jacket, said conductors extending a short distance out of one end of said jacket adjacent an end of said cord, a pair of contacts electrically connected to the extending ends of said conductors, said cord including said jacket being tied in a knot adjacent to said end of the cord, and a body of material molded around and enclosing and closely embracing said knot and the extending ends of said conductors and at least a portion of said contacts whereby a tensile force applied to said cord is transmitted directly from substantially the entire outer surface of said jacket within said knot directly to and through said body to said contacts resulting in said conductors and the connections between said conductors and said contacts being relieved of stress caused by the applied force.

6. In an electrical cord device, an insulated electric cord comprising a pair of individually insulated conductors enclosed in a relatively strong insulating jacket, said condutcors extending a short distance out of one end of said jacket adjacent one end of said cord, a pair of contacts electrically connected to the extending ends of said conductors, a plate member having a plurality of closely spaced apertures therethrough, said cord having portions including said jacket adjacent to said end of the latter extending through said apertures so as to be sharply bent thereby, and a body of material molded around and enclosing and closely embracing said plate member and said bent portions and the extending ends of said conductors and at least a portion of said contacts whereby a tensile force applied to the cord is transmitted directly to said body from substantially the entire outer surface of said jacket at the plate-bent portions thereof through said body to said contacts, said conductors and the connections beween said conductors and said contacts being thereby relieved of stress produced by said force.

References Cited by the Examiner

UNITED STATES PATENTS

1,731,274	10/1929	Shaler	339—105 X
1,856,681	5/1932	Wolcott	339—195 X
2,209,814	7/1940	Finger	339—101
2,223,153	11/1940	Seifer	339—106
2,566,912	9/1951	Stotenbur	339—105
2,636,070	4/1953	Judisch	339—62
3,093,432	6/1963	King	339—59

FOREIGN PATENTS

1,123,341	6/1956	France.
1,020,395	12/1957	Germany.
528,195	10/1940	Great Britain.
739,759	11/1955	Great Britain.

PATRICK A. CLIFFORD, *Primary Examiner.*

A. S. TRASK, *Assistant Examiner.*